

## Appendix A - Draft

PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:  
DONALD M. JUSTUS

Serial No.: 10/616,054

Filed: July 9, 2003

Title: "LOW COST METHOD AND  
APPARATUS FOR FRACTURING A  
SUBTERRANEAN FORMATION WITH A SAND  
SUSPENSION"

§ Group Art Unit: 3672  
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§ Examiner: STEPHENSON, DANIEL P.  
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§ Atty. Docket No. 2003-IP-010088U1  
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## CERTIFICATE OF TRANSMISSION VIA FACSIMILE

PURSUANT TO 37 C.F.R. §1.8, I HEREBY CERTIFY THAT I HAVE  
SENT THIS CORRESPONDENCE VIA FACSIMILE TRANSMISSION TO:  
EXAMINER DANIEL R. STEPHENSON AT FACSIMILE NUMBER  
571.273.7035, AT THE TIME AND ON THE DATE INDICATED  
BELOW.

**DRAFT**

CYNTHIA POSER  
SECRETARY TO PAUL R. MORICO (REG. No. 35,960)

TIME, DATE OF TRANSMISSION: \_\_\_\_\_ CST  
08/17/2005

TO FACSIMILE NUMBER: 571.273.7035

**DRAFT PROPOSED AMENDMENT**  
**UNOFFICIAL COMMUNICATION**

The undersigned attorney of record submits the following proposed amendment for the Examiner's consideration. The undersigned invites the Examiner to contact the undersigned to discuss said proposed amendment at the Examiner's earliest convenience.

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Serial No. 10/616,054  
DRAFT PROPOSED AMENDMENT

**PROPOSED AMENDMENTS TO THE CLAIMS**

1. A method of fracturing a subterranean formation comprising the steps of:  
  
injecting a fracture fluid into a centrifugal pump;  
  
injecting a controlled amount of a sand suspension into the centrifugal pump;  
  
mixing the fracture fluid and sand suspension in the centrifugal pump;  
  
discharging a the mixture of the sand suspension and fracture fluid from the centrifugal pump ~~having a certain concentration;~~  
  
~~monitoring~~ measuring the concentration of the mixture being discharged from the centrifugal pump and comparing the measured concentration of the mixture to a desired concentration of the mixture;  
  
varying the amount of the sand suspension being injected into the centrifugal pump with a control pinch valve until a the desired concentration of the mixture is attained; and  
  
pumping the mixture downhole into the subterranean formation using a separate pump.
2. A method of fracturing a subterranean formation according to claim 1 further comprising the step of injecting a liquid additive into the centrifugal pump.

3. A method of fracturing a subterranean formation according to claim 1 wherein the fracture fluid comprises a liquid selected from the group consisting of water, gelling agent, brine, acid, oil, foam and mixtures thereof.

4. A method of fracturing a subterranean formation according to claim 3 wherein the oil has been recovered from the subterranean formation being fractured.

5. A method of fracturing a subterranean formation according to claim 1 wherein the sand suspension comprises a mixture of xanthan in a concentration of about 60 lb./gal and sand in a concentration of about 20-24 lb./gal.

6. A method of fracturing a subterranean formation according to claim 5 wherein the sand suspension further comprises a water.

7. A method of fracturing a subterranean formation according to claim 2 wherein the liquid additive comprises a liquid selected from the group consisting of a breaker fluid, a clay control fluid, a cross-linking agent, a pH control agent and mixtures thereof.

8. An apparatus for fracturing a subterranean formation comprising:  
a control pinch valve that meters flow of a sand suspension;

a centrifugal pump having an inlet into which the sand suspension is injected and an outlet out of which a mixture of the sand suspension and a fracture fluid is discharged;

means for measuring the concentration of the mixture being discharged from the centrifugal pump, comparing the measured concentration of the mixture to a desired concentration of the mixture and sending control signals to the control valve to vary the amount of the sand suspension being injected into the centrifugal pump until the desired concentration of the mixture is attained; and

a separate pump that pumps the mixture discharged from the centrifugal pump downhole into the subterranean formation.

9. An apparatus for fracturing a subterranean formation according to claim 8 ~~further comprising an~~ wherein the means comprises an electronic control system that comprises a flow meter and densometer that measure the flow rate and viscosity, respectively, of the mixture being discharged from the centrifugal pump and a microprocessor connected to the flow meter, densometer, and control ~~pne~~h valve.

10. An apparatus for fracturing a subterranean formation according to claim 8 further comprising another centrifugal pump disposed between the control ~~pne~~h valve and the centrifugal pump that injects the sand suspension into the centrifugal pump.

11. An apparatus for fracturing a subterranean formation according to claim 8 further comprising a positive displacement pump that injects a liquid additive into the centrifugal pump.

12. An apparatus for fracturing a subterranean formation according to claim 11 wherein the positive displacement pump is electronically connected to ~~an~~ the electronic control system.

13. An apparatus for fracturing a subterranean formation according to claim 8 wherein the downhole pump comprises two positive displacement pumps electrically coupled to one another by a Local Area Network cable.

14. An apparatus for fracturing a subterranean formation according to claim 8 wherein the sand suspension comprises a mixture of xanthan in a concentration of about 60 lb./gal, sand in a concentration of about 20-24 lb./gal, and water.

15. An apparatus for fracturing a subterranean formation according to claim 8, wherein the fracture fluid comprises a liquid selected from the group consisting of water, gelling agent, brine, acid, oil, foam and mixtures thereof.

16. An apparatus for fracturing a subterranean formation according to claim 11 wherein the liquid additive comprises a liquid selected from the group consisting of a breaker fluid, a clay control fluid, a cross-linking agent, a pH control agent and mixtures thereof.

Respectfully submitted,

**DRAFT**

Date: August 17, 2005

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